

AMD Athlon™ System Cooling Guidelines

These guidelines will assist in the selection of components that provide proper cooling for systems using AMD Athlon processors. No amount of laboratory testing can ensure that every custom configuration will have been tested. Therefore, we offer these guidelines as a way to help you avoid system-cooling problems.

Statement of Problem

As higher performing systems become available, power consumption of the system's components (processor, hard disk, and graphics processor) continues to increase. Without proper protection, these components can begin to fail due to operation outside of their intended temperature specifications. Therefore, steps must be taken to ensure that the overall system provides adequate airflow to maintain proper operating temperatures for all of the installed devices.

Chassis Cooling Guidelines

After testing many system cases, a pattern of characteristics became apparent that proved to be essential to ensure the proper cooling of a system. Figure 1 shows a typical mid-tower chassis that illustrates these features, and also shows suggested airflow characteristics.

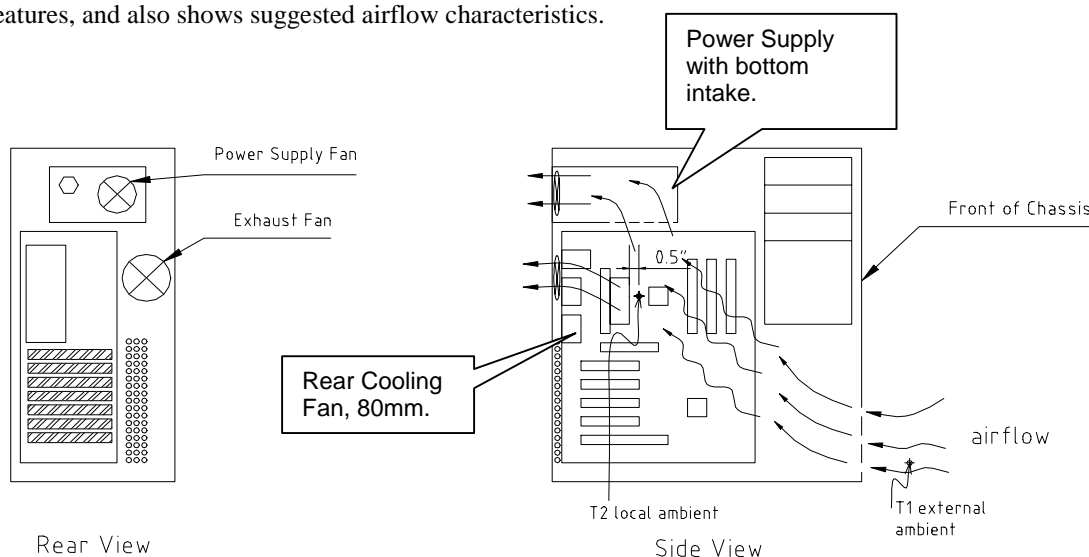


Figure 1 Required Features and Airflow Characteristics.

Power Supply as Part of the Cooling Solution

The phrase “ATX-style” has come to mean various things to different people. If you are using a full-tower or mid-tower case, you need to be aware of the characteristics of the power supply you use. First, only use a power supply that is on the AMD Athlon Processor Recommended Power Supply list. Second, for best results, use a power supply with venting in the processor region (that means primary air-intake is on the bottom of the power supply, not the front of the power supply). Some power supplies have “NLX-style” venting (the primary air intake is at the front of the power supply) and does not pull air from the processor area (see below).

	Desirable Version	Undesirable Version	
Rear:			They look about the same! (Differences are brand specific)
Front			Intake only in front is not optimal
Bottom			Bottom intake cools the CPU best.

Rules of Thumb for Proper Cooling

1. Use an adequate heatsink, sized for the processor speed you are using. Make certain it has the proper sized fan(s). Check the [AMD Athlon Processor Recommended Heatsink Page](#) for specifics.
2. Make sure the thermal compound (grease, phase-change or pads) you use is recommended by AMD. If you use a recommended heatsink, it is normally already included.
3. Use an auxiliary exhaust rear chassis fan, suggested size of 80 millimeters or larger. The fan intake should be near the location of the processor.
4. For best results, use an ATX power supply with air intake venting in the processor region (that means the primary air-intake is on the bottom of the power supply, not at the front of the power supply). Supplies with NLX-style venting (primary air intake is at the front of the power supply) do not pull air from the processor area!
5. Make sure all the internal wires and cables are routed carefully so as to not block or hinder airflow through the case. Use tie-wraps judiciously to accomplish this.
6. Many cards generate a lot of heat (AGP cards in particular). Try to either leave the slot next to these cards open, or use a shorter card in these slots to allow airflow around cards that are heat producers—typically those cards with many electrical components.
7. High-speed hard-drives (especially 10,000 RPM SCSI hard drives) produce a great deal of heat. One way to minimize any problems with these drives is to mount them in 5.25" frames and install them in the larger drive bays, which allows a greater airflow around them, and can cool them more effectively.
8. A front cooling fan does not seem to be essential. In fact, in some extreme situations, testing showed these fans to be recirculating hot air rather than introducing cool air.

Summary

With proper attention to a system's thermal needs as detailed in this paper, system cooling can be achieved which will maintain the proper operating temperatures for all the devices in a system.

🔗 [Click here for a briefer, more technical version of this document with formulas for calculating maximum cooling temperature rise.](#)

© 2000 Advanced Micro Devices, Inc. All rights reserved.

Trademarks

AMD, the AMD logo, and combinations thereof, AMD Athlon, and AMD-K7 are trademarks of Advanced Micro Devices, Inc. Any other trademarks used are owned by their respective trademark holders.